

cc: Max M. Howie, Jr., ATSDR/DHAC/PERIS ✓
Dr. Paul Chapp, ATSDR/DHAC w/enclosure ✓
Dr. Kandiah Sivarajah, PADOH ✓
Bill Belanger, EPA Region III w/enclosure ✓
Frank Bertovich, PADOH, Northcentral District (under separate cover) ✓
Michael Welch, PADEP, North Central Region (under separate cover) ✓
Robert Maiers, PADEP, Harrisburg, PA (under separate cover) ✓
James Kottan, NRC, King of Prussia, PA (under separate cover) ✓

AR100002

*Sent to Linda Porter, PA
Cheryl, Bill, Delaney
Mr. Howard & Patricia M.
Robert R. Mince, Jr.*

Health Consultation 9/7/2000

SAFETY LIGHT SITE

BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA

CERCLIS NO. PAD987295276

AUGUST 9, 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

AR100003

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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AR100004

HEALTH CONSULTATION

SAFETY LIGHT SITE

BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA

CERCLIS NO. PAD987295276

Prepared by:

Pennsylvania Department of Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

AR100005

SUMMARY

The Safety Light Corporation site (the site) is an active manufacturing facility off Old Berwick Road, Bloomsburg, Columbia County, Pennsylvania, next to the Susquehanna River. Employees of the Safety Light Corporation use tritium in the manufacture of self-illuminated signs. Past disposal practices of various radioactive isotopes at the site resulted in radiological contamination of on-site soils and groundwater.

At the request of the U.S. Environmental Protection Agency Region III (USEPA), the Pennsylvania Department of Health (PADOH), working under a Cooperative Agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), prepared this Health Consultation (HC). USEPA desires to know if the residents near the site are exposed at levels of concern to radiological or nonradiological contamination that may be migrating offsite from past disposal practices on site. PADOH and ATSDR conclude that the site is not a public health hazard with respect to nonradiological contamination related to the site. However, due to recent remedial activity and on-site staging of drummed radiological waste, PADOH and ATSDR conclude that the site could pose a public health hazard in the future if the Susquehanna River floods and flood waters reach that staging area.

Conclusions and recommendations herein are specific to the site. PADOH provides conclusions and recommendations based on the data and information referenced. Additional data could alter the recommendations being presented. PADOH is committed to reviewing additional data and responding to additional requests upon receipt.

BACKGROUND AND STATEMENT OF ISSUES

Introduction

In this document, PADOH evaluates contamination related to industrial activity at the Safety Light Corporation (the site). PADOH requested technical assistance from ATSDR to assess the human health aspects of exposure to site-related radiological contaminants. ATSDR responded with a Health Consultation (HC) that focuses on radiological contamination on and near the site. PADOH has included ATSDR's HC as an attachment to this document. The reader is referred to the Attachment for details.

Site Description and History

The Safety Light Corporation site (the site) is an active manufacturing facility occupying approximately 2 acres of a 10-acre property southeast of Old Berwick Road in South Centre Township, Columbia County. The remaining 8 acres of the property are leased to third parties. There is no evidence that employees of the third parties are being exposed. A residential area lies across Old Berwick Road from the site. Residential areas bound the site to the northeast and southwest. The Susquehanna River abuts the site to the southeast. The site is completely fenced

on all sides, thus making it secure to the casual passerby. The nearest residences are along Old Berwick Road, although one residence is west-southwest of the site just outside the fence (Appendix A, Figures 1 and 2) (1).

Safety Light Corporation (the company) used radioactive materials in manufacturing various devices including radioactive sources for civil defense equipment, U. S. Navy products, and lighting products. In its early history, the company used radium 226 (Ra 226) and polonium 210 (Po 210) for light sources or other manufacturing processes. Later, the company used cesium 137 (Cs 137) and strontium 90 (Sr 90) for civil defense devices and US Navy ship deck markers, respectively. Currently, tritium (H-3) is used for emergency lighting devices. During production of the various devices, the company placed radioactive wastes in two underground silos (each 10 ft. diameter by 10 ft. deep) south of the main building (Appendix A, Figure 3 labeled "burial pit"). When the silos were closed in 1960, the company shipped the wastes offsite to licensed radioactive waste burial facilities. The company routed liquid wastes produced on the site to a nearby abandoned canal associated with the Susquehanna River or to a holding tank and evaporator system (2).

The company continues to make lighting products with radioactive material as the energy source and currently holds two licenses administered by the U. S. Nuclear Regulatory Commission (USNRC) or its predecessor, the Atomic Energy Commission. In the 8 acres not under USNRC license, third party companies, USR Metals, Inc. and Multimetals Products Corp. (Multimetals), conduct nonradiological manufacturing processes that include metal finishing and plating (3).

Several events occurred that have resulted in the spread of radiological contamination on the site. These include the Tropical Storm Agnes flood in 1972 that destroyed the holding tank and evaporator and impacted the former canal and east lagoon (2).

Since the 1960 time frame, the company has undertaken various clean-up efforts including decontamination of buildings, backfilling of on-site lagoons and removal of soils contaminated with Ra 226. Extensive site-related environmental testing for radiological contaminants is described in ATSDR's HC (Attachment) (2). The reader is referred to that document for a discussion of those contaminants.

NUS Corporation (NUS) prepared a Preliminary Assessment of the site for USEPA in about 1991. NUS listed numerous environmental and occupational safety/health violation citations issued to the company between 1957 and 1988. NUS also listed several environmental violation citations issued to Multimetals (1).

Roy F. Weston, Inc., (Weston) sampled groundwater at the site on March 29-30, 1994 and analyzed the samples for radiological, inorganic (nonradiological), and organic (nonradiological) constituents. The results of analyses are included in this HC as Appendix B, Tables 1, 2 and 3 (4). Weston sampled two off-site residential wells that are cross-gradient from the site and two on-site monitoring wells.

For nonradiological organic constituents, Weston reported that the residential wells contained traces of tetrachloroethene (PCE) below USEPA's maximum contaminant level (MCL), but the results were qualified as possibly being not accurate or precise. All other reported parameters were either below a level of concern or were found in the laboratory or field blanks (4).

For nonradiological inorganic constituents, Weston reported that one on-site monitoring well, MW-4, contained some metals at levels that would be of marginal concern, such as lead at a level of 41.8 micrograms per liter, if any exposure pathways existed. However, the groundwater contamination was limited to on-site areas (4). Although the 1994 data is the most recent data available, PADOH's hydrogeologist has analyzed the site and believes that the shallow groundwater in the area is moving from the site directly toward the Susquehanna River. On-site groundwater is not used for any purpose other than monitoring (5).

The most recent effort by the company to clean up the site has resulted in the removal of radwaste from the silos and staging of the radwaste in drums and containers on site. By June 20, 2000, the company had staged 176 drums (55-gallon) and 26 B-25 containers (4 ft. x 4 ft. x 6 ft.) that contain varying levels of radwaste. The staging area is near the eastern edge of the property about 200 feet from the Susquehanna River (6). PADOH estimates the closest drums to the river are about 30 feet above mean low water level. Note that ATSDR's HC was published before the radwaste was removed from the buried silos and staged on site in drums and containers.

As of June 20, 2000, the chemical nature of the radwaste is undergoing analysis. Company officials reported orally to PADOH that "hotter" radwaste is in the drums. They also reported that it is possible that the radwaste is mixed with nonradiological hazardous waste. The company took six samples of the contents of the buried silos during the removal process. The results of chemical analyses of those samples are not final, thus presenting a significant data gap (6).

Site Visit

On January 11, 2000, Mark Lavin of PADOH's Division of Environmental Health Assessment (the staff), conducted a site visit and met with representatives of the company, USNRC, and the Pennsylvania Department of Environmental Protection (PADEP). The purpose of the site visit was to verify information collected during site file reviews and interviews with knowledgeable parties, and to gather essential information not found during those two previous steps. During the site visit, the staff toured the site, took photographs, and interviewed company representatives, as well as USNRC and PADEP officials. The company was removing radwaste from the buried silos at that time as part of a major remediation project.

The staff also contacted local government officials on January 11, 2000, to ask if anyone living near the site had expressed health concerns related to releases of contaminants at the site. The

township manager for South Centre Township said that nobody has contacted the local authorities with any such concerns.

On June 20, 2000, Mr. Lavin revisited the site and met with ATSDR, USNRC, PADEP, USEPA and company officials. The group toured the site and examined the staging area for the drummed radwaste. Several members made radiological measurements at numerous locations on and near the site. ATSDR plans to issue an addendum to the radiological HC to include a summary of the measurements recorded.

DISCUSSION

From a nonradiological perspective, the site is not a public health hazard. The site is securely fenced and no on-site groundwater is used for human consumption or industrial processing. Surface runoff is not suspected to be a problem. Groundwater is moving from the site toward the Susquehanna River and no domestic wells are between the site and the river. Two domestic wells are cross-gradient from the site. The company owns the property served by the well to the east, but nobody lives in the home. 1994 chemical analyses data for the wells show that no significant nonradiological contamination existed at that time.

From a radiological perspective the site could pose a public health hazard in the future. ATSDR's HC (Attachment) discusses the radiological contamination in detail, but the HC was written before the company staged the drums and containers filled with radwaste on site and about 200 feet from the Susquehanna River. PADOH estimates that the position where the radwaste is stored was under about four (4) feet of water during the 1972 flood caused by Tropical Storm Agnes. PADOH and ATSDR view this storage location as vulnerable to natural flooding and believe the drums should be moved to a more secure location while they await final disposition.

ATSDR'S CHILD HEALTH INITIATIVE

PADOH and ATSDR recognize that infants and children may be more sensitive to environmental exposure than adults in communities faced with contamination of their water, soil, air, or food. This sensitivity is a result of the following factors: (1) children are more likely to be exposed to certain media (e.g., soil or surface water) because they play outdoors; (2) children are shorter than adults, which means that they can breathe dust, soil, and vapors close to the ground; and (3) children are smaller, therefore childhood exposure results in higher doses of chemicals per body weight. Children can sustain permanent damage if these factors lead to toxic exposure during critical growth stages. PADOH and ATSDR are committed to evaluating their special interest at sites such as the Safety Light Corporation site (the site), as part of ATSDR's Child Health Initiative.

PADOH and ATSDR evaluated the likelihood that children living near the site may have been or may be exposed to contaminants at levels of health concern. PADOH and ATSDR did not identify any situations where children are likely to be or have been exposed to contaminants at

levels that would be associated with adverse health effects. PADOH and ATSDR based this conclusion on several factors after reviewing the available data, including:

- a. PADOH and ATSDR identified no off-site completed exposure pathways.
- b. PADOH and ATSDR identified no on-site completed exposure pathways because the site is secure and nobody is using the contaminated groundwater.

CONCLUSIONS

PADOH and ATSDR conclude that the site poses no public health hazard with respect to nonradiological contamination because of the nonexistence of completed exposure pathways. A plume of on-site groundwater contaminated with nonradioactive lead is moving toward the Susquehanna River. No residential wells are threatened by the contaminant plume. The Susquehanna River is not threatened by the plume of lead, either.

However, with respect to radiological contamination, PADOH and ATSDR conclude that the site would likely be a public health hazard if Susquehanna River flooded. This is so because the drums containing radiological waste that are staged on site could be affected by a flood with a magnitude rivaling that of 1972's Tropical Storm Agnes, which would put the staging area under water.

RECOMMENDATIONS

PADOH and ATSDR recommend that appropriate government regulators take immediate action to remove the on-site radiological waste in drums and containers to a more secure site. The present storage location is vulnerable to flooding from the Susquehanna River.

PADOH and ATSDR recommend, further, that the domestic well just west of the site be resampled for nonradiological constituents to update the 1994 sampling data.

PUBLIC HEALTH RECOMMENDATIONS AND ACTIONS

1. PADOH will review sampling data and prepare Health Consultations as appropriate.
2. PADOH will be available to conduct additional public health assessment activities.

REFERENCES

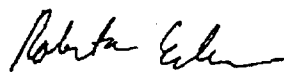
1. NUS Corporation Superfund Division. Field Investigation Team Activities at Uncontrolled Hazardous Substances Facilities-Zone I--Safety Light Corporation. Undated.
2. Agency for Toxic Substances and Disease Registry. Health Consultation for Safety Light Corporation, Bloomsburg, Columbia County, Pennsylvania. Atlanta: ATSDR, March 2, 2000.
3. Monserco Limited. Characterization Survey of Safety Light Corporation Site at Bloomsburg, Pennsylvania, U.S.A. September 5, 1996.
4. Roy F. Weston, Inc. Memorandum to Kevin Wood from Donna Janda re: Analytical Results of Groundwater Sampling at the Safety Light Site. July 27, 1994.
5. Oral communications with Larry Harmon, Safety Light Corporation. March 9, 2000.
6. Oral communications with Larry Harmon, Safety Light Corporation. May 18, 2000.

PREPARER OF REPORT

Mark A. Lavin, B.S.
Environmental Health Specialist
Pennsylvania Department of Health

CERTIFICATION

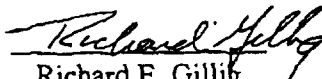
This Safety Light Corporation Health Consultation has been prepared by the Pennsylvania Department of Health under Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.



Roberta Erlwein

Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Health Consultation and concurs with its findings.



Richard E. Gillig

Chief, SPS, SSAB, DHAC, ATSDR

Appendix A

FIGURES

Figure 1

Safety Light Corporation Site Location Map

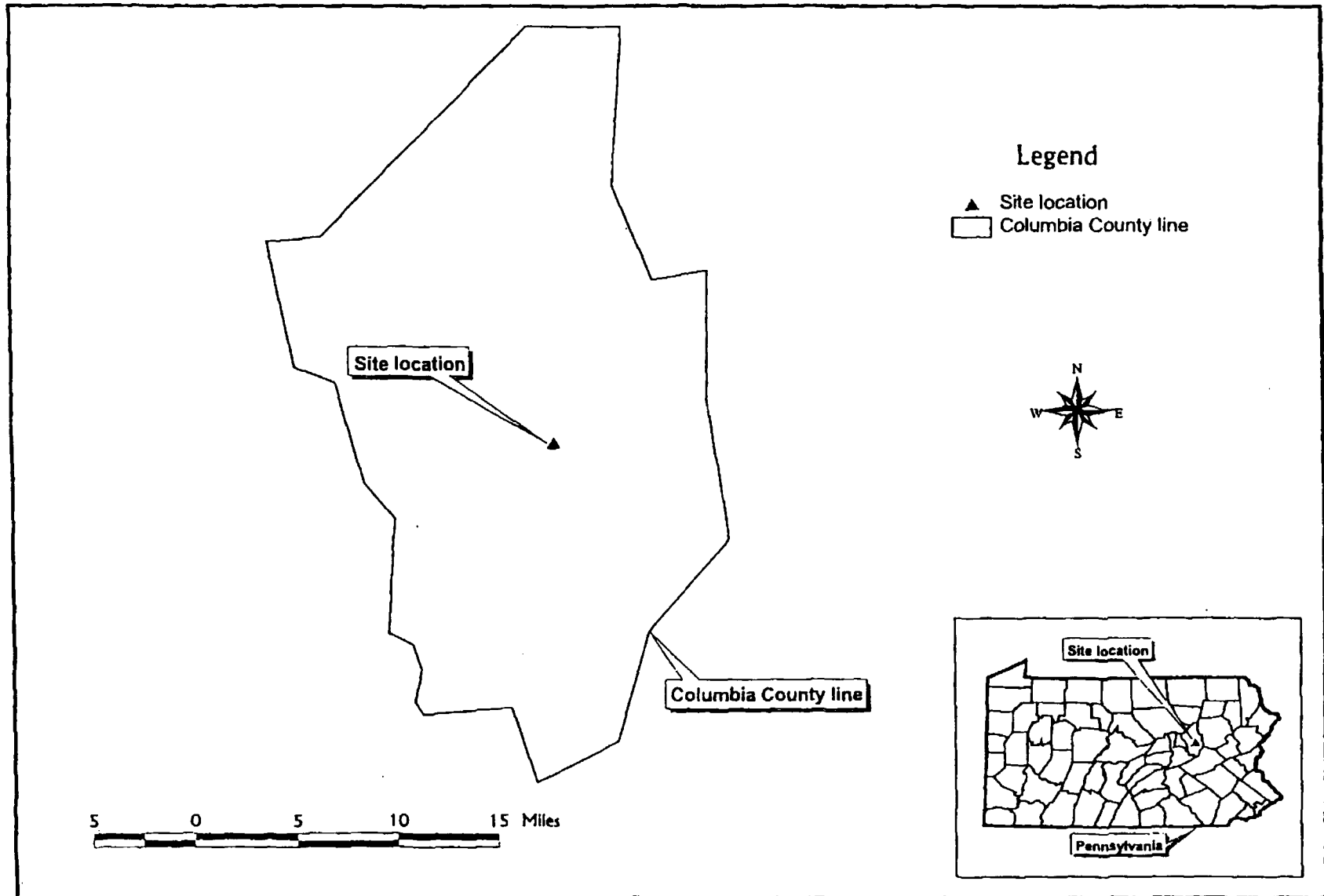
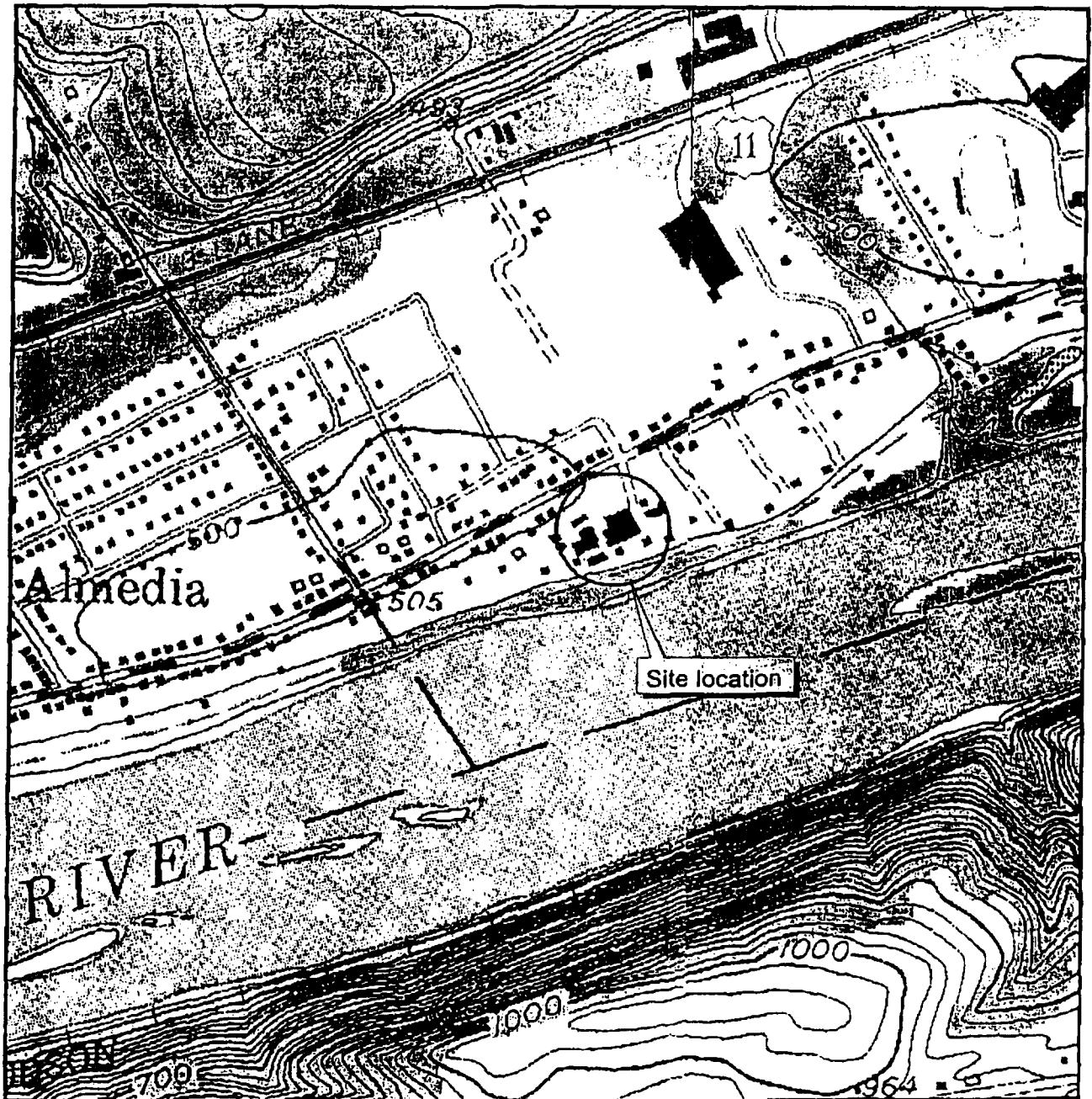


Figure 2

Safety Light Corporation
Site Location Map



0.2 0 0.2 0.4 Miles

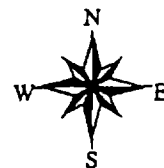
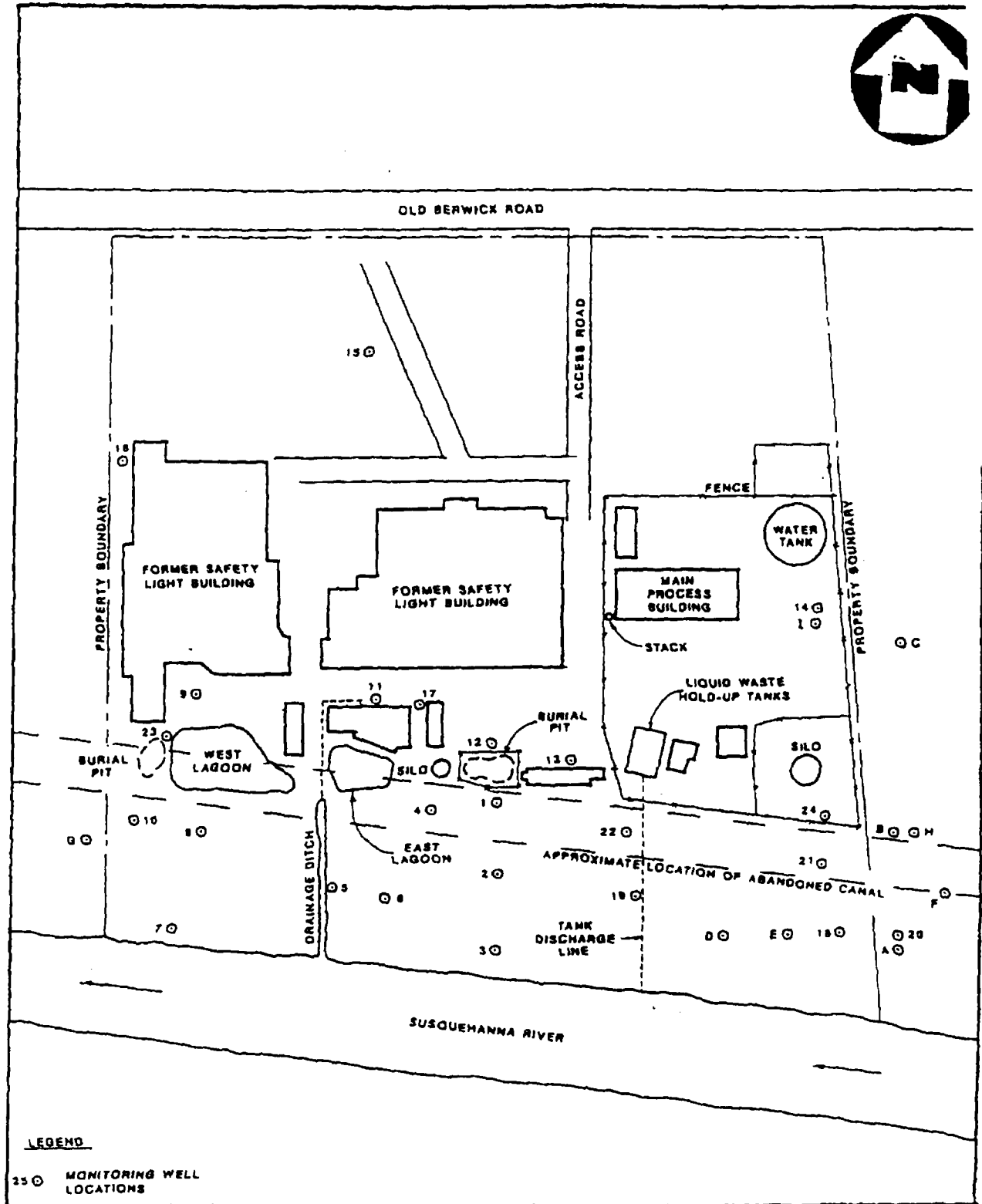


Figure 3



SITE SKETCH
SAFETY LIGHT CORPORATION, BLOOMSBURG, PA
 (NO SCALE)



AR100016

Appendix B

TABLES

Table 1: Safety Light Analytical Results - Radiological

SAMPLE LOCATION	Ra-226	H-3	Sr-90	Cs-137
RW-2		2015		
RW-3		673	2.6 B	
RW-4		2670	2.2 B	
RW-5		1595	3.2 B	
RW-6		1770		
RW-7		1109	3.7 B	
MW-4	3.26	4208	59.9	
MW-5	60.45	2372	3.5 B	106
MW-5 (dup)	78.28	2424	4.5 B	132
MW-14	2.34	5727		
MW-15		1898	4.4 B	
MW-16	3.03	2052	13.6	
FB			2.0	

All results are reported in units of pCi/L.

B: Not detected substantially above the level reported in laboratory or field blanks.

Table 2: Safety Light Analytical Results - Inorganic

Analyte	RW-2	RW-4	MW-4 (unf)	MW-4 (fil)	Field Blank
Aluminum			12,300	[34.6]	
Arsenic		[7.2] L			
Barium	[36.0]	[25.7]	[185]	[50.4]	
Beryllium			[0.90] B	[0.47] B	
Cadmium	[3.4]		[3.8]	[2.6]	
Calcium	27,800	31,700	29,400	29,000	[87.1]
Chromium			13.8 L		
Cobalt			[11.1]		

AR100018

Analyte	RW-2	RW-4	MW-4 (unf)	MW-4 (fil)	Field Blank
Copper	32.5	172	38.5	[9.7]	
Iron	[37.0] B	[35.6] B	15,400	[105] B	[27.6]
Lead	[2.7] B	[2.3] B	41.8	[1.5] B	[2.0] K
Magnesium	5,900	[5,320]	6,070	[4040]	
Manganese	[2.4] L		1,870	1,260	
Mercury				0.33	
Nickel			44.5 L	[29.9] L	
Potassium	[1,500]	[1,420]	5,870	[2,940]	
Selenium	[2.7]	[4.4]	[2.9]	[2.3] B	
Sodium	12,500	8,720	12,300	12,300	[59.1]
Vanadium			[20.2]		
Zinc	58.2	[10.0] B	163	98.1	[5.4] B
Cyanide				Q	

All results are reported in ug/L.

B: Not detected substantially above the level reported in laboratory or field blanks.

[]: Analyte present. As values approach the IDL, the quantitation may not be accurate.

K: Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L: Analyte present. Reported value may be biased low. Actual value is expected to be higher.

Q: No analytical result.

AR100019

Table 3: Safety Light Analytical Results - Organic

Compound	RW-2	RW-4	MW-4	Trip Blank
Methylene chloride	11 B	10 B	11 B	19 J
Tetrachloroethene	2 J		2 J	
bis(2-Ethylhexyl) phthalate		4 B	1 B	
Compound	MW-5	MW-5 (dup)	MW-15	Field Blank
Methylene chloride	17 B	14 B	15 B	13 J
Tetrachloroethene	2 J	2 J		
Chloroform				4 J
bis(2-Ethylhexyl) phthalate	2 B	3 B	4 B	14 B

All results are reported in ug/L.

B: Not detected substantially above the level reported in laboratory or field blanks.

J: Analyte present. Reported value may not be accurate or precise.

Attachment

Health Consultation

Radiological Contamination

SAFETY LIGHT SITE

BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA

CERCLIS NO. PAD987295276

APRIL 20, 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

AR100022

HEALTH CONSULTATION

Radiological Contamination

SAFETY LIGHT SITE

BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA

CERCLIS NO. PAD987295276

Prepared by:

Federal Facilities Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances And Disease Registry

AR100023

BACKGROUND AND STATEMENT OF ISSUES

The Agency for Toxic Substances and Disease Registry (ATSDR) is preparing this public health consultation in support of the Pennsylvania Department of Health (PaDoH) activities at the Safety Light Corporation (SLC) in Bloomsburg, Columbia County, Pennsylvania. SLC is a 10-acre site where radioactive materials were used in manufacturing various devices including radioactive sources for civil defense equipment, US Navy products, and lighting products. Lighting products continue to be made with radioactive material as the energy source. The site is bounded by the Susquehanna River to the south and Old Berwick Road (Route 11) on the north. In its early history, SLC used radium 226 (Ra 226) and polonium 210 (Po 210) for light sources or other manufacturing processes. In the 1960s, Ra 226 was replaced with Americium 241 (Am 241) in unspecified processes [1]. Later, strontium 90 (Sr 90) and cesium 137 (Cs 137) were used for civil defense devices and deck markers for the US Navy, respectively. Currently, the tritium (H-3) is used for emergency lighting devices. SLC holds two licenses for use of radioactive material issued by the Nuclear Regulatory Commission (NRC) or its predecessor, the Atomic Energy Commission. The current licenses are License Number 37-00030-02 (for the cleanup) and License Number 37-00030-08 (tritium use).

During the production of the various devices made by SLC, radioactive wastes were placed in two underground silos. When the silos were closed in 1960, the wastes were shipped off-site to licensed radioactive waste burial facilities. Liquid wastes produced on the site were routed to a nearby abandoned canal associated with the Susquehanna River or to a holding tank and evaporator system.

Since the 1960 time frame, various clean up efforts have been undertaken including decontamination of buildings, backfilling of on-site lagoons and removal of soils contaminated with Ra 226. Several events occurred that have resulted in the spread of contamination on the site. These include a flood in 1972 that destroyed the holding tank and evaporator as well as impacting the former canal and east lagoon [1].

The site is completely fenced on all sides and the nearest residences are on Old Berwick Road, across from the site.

The Pennsylvania Department of Health requested that ATSDR review the radiological data associated with on-site contamination and off-site residential wells to determine if the radiological contaminants are present at levels of health concern.

DISCUSSION

Several sampling and characterization studies have taken place. These include: 1) Sampling in 1980 by the Oak Ridge Associated Universities (ORAU) in support of the NRC activities of that era [discussed in reference 1]; 2) Sampling of the river from as early as 1991, the residential Murphy Well (located west of SLC) and the residential Vance/Walton Well to the east [2]; 3) Additional sampling by a technical assistance team (TAT) for the Environmental Protection

Agency [3] and; 4) Sampling and characterization by the SLC contractor, Monserco Limited, in support of the NRC license [1]. A brief synopsis of these sampling events is as follows.

The ORAU study was an extensive survey of the site for the NRC. The survey included surface soils and subsurface soils, groundwater and surface water, vegetation, and aquatic organisms. Although ORAU reported the radiation levels were above typical background radiation for the area, they were still less than the federal guidelines in place in the 1980s. The analysis of on-site soils showed elevated concentrations of Sr 90, Cs 137, and Ra 226 in soils. The analysis of on-site groundwater showed these same radioisotopes were elevated as was H 3. For H 3, Sr 90, and Ra 226, the maximum concentrations found exceeded the Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) for public water supplies (Table I). From these results, the ORAU study infers that site related contaminants were migrating into soils and groundwater on the SLC site but not off site [1].

Table I. Current Contaminant Levels in on-site monitoring wells and Maximum Contaminant Levels for radionuclides in public water supplies

Contaminant	Maximum concentrations detected in on-site monitor wells (picocuries per liter)	Maximum Contaminant Level (picocuries per liter)
Gross alpha radiation	15	15
Gross beta	20	50 (for man-made radionuclides)
Tritium (H 3)	72,200	20,000
Strontium 90 (Sr 90)	62,100	8
Cesium 137 (Cs 137)	57	200
Radium 226 (Ra 226)	9.1	5*

*The MCL is 5 for combined Ra 226 and Ra 228.

The river was sampled at 5 stations along the river boundary of the site. The parameters supplied to ATSDR only included gross alpha and gross beta measurements. None of the river water samples collected and measured had gross alpha radiation or gross beta radiation in excess of the current EPA MCL values for these parameters (Table I) [2].

The Murphy Well and the Vance/Walton Well were sampled for gross alpha radiation, gross beta radiation, and H-3. Gross alpha and gross beta measurements were below the current MCL or screening values for these contaminants. In the case of H-3, the values also were below the current MCL of 20,000 picocuries per liter (pCi/L; 741 becquerels per liter, Bq/L). However, the data suggests that H 3 releases from the site may be impacting the wells as the values of H 3 appear to be elevated above typical groundwater concentrations. In groundwater, H 3 can vary with the age of the groundwater and the degree the groundwater is recharged from surface waters.

Modern day values of H 3 in groundwater have declined to levels between 160 and 320 pCi/L (6 to 12 Bq/L) with the decline attributed to the elimination of atmospheric nuclear weapons testing and radioactive decay. The H 3 concentrations of the Murphy Well ranged from below detection levels to approximately 9600 pCi/L (355 Bq/L) in April 1990. As recently as July 1998, the tritium concentration was measured at 2950 pCi/L (110 Bq/L); albeit since that time, the levels have been less than the minimum detectable activity. In the Vance/Walton Well, the maximum H 3 value was reported in November 1985 at a concentration of 11,300 pCi/L (419 Bq/L). The last positive reporting value was 2177 pCi/L (81 Bq/L) in November 1999 [2].

In 1994, the EPA TAT sampled additional residential wells for Ra 226, Sr 90, Cs 137, and H 3 and 5 on-site monitoring wells. The results show that the residential wells contained H 3 with concentrations ranging from 673 to 2670 pCi/L (25 to 99 Bq/L). On-site monitor wells also showed elevated concentrations of H 3. All values detected were below the MCL. Groundwater from the monitoring well located in the drainage ditch connecting the river to the abandoned canal measured about 70 pCi/L (2.6 Bq/L) Ra 226 and about 120 pCi/L (4.4 Bq/L) for Cs 137. The MCL for Ra 226 is 5 pCi/L (0.19 Bq/L) and for Cs 137, the MCL is 200 pCi/L (74 Bq/L) [3].

In the 1996 characterization study performed by Monserco, samples were collected on site from monitoring wells, soils, and a survey of the grid system with hand-held instruments. Five monitoring wells, between the river and the main buildings tested positive for H 3, Sr 90, and Cs 137. The concentrations detected in these wells were in excess of existing MCL values. Based on the well locations, the contamination appears to be originating from the vicinity of the former silos where H 3, Sr 90 and Cs 137 disposal occurred. The tritium contamination appears only in one additional well associated with the liquid waste building; however, H 3 in the well downgradient of that building did not have elevated levels of H 3. Other monitoring wells downgradient do show H 3 present at levels 20% to 50% of the levels in the liquid waste building well.

A spatial analysis of the contamination in the monitoring wells suggests that Cs 137 may be moving toward the river. Sr 90 also might be migrating toward the river but perhaps not as rapidly as contamination was only found in wells closer to the silo areas. Furthermore, since the initial ORAU study, the concentrations of H 3, Sr 90, Cs-137 reported in the Monserco 1996 characterization report exceed the maximum amounts reported in the 1980 ORAU study.

Analysis of the soils collected from the bore holes produced during construction of the monitoring wells showed that Cs 137 contamination generally follows the same patterns as that seen in the well water samples and that the contamination is present at the soil surface and at a shallow depth (0 to 1.22 meters). Only in 2 wells was contamination deeper (1.83 to 4.27 meters). Overall, contamination generally decreased with depth in all but well M12, approximately 100 meters from the silo area.

To analyze the soil contamination, ATSDR used the screening values developed by the National Council on Radiation Protection and Measurements (NCRP) Report 129 for use at industrial and

commercial facilities [4]. The characterization document says that the screening was done by gamma spectroscopy that will not detect Sr 90 and may over-report Ra 226 because of interference from other naturally occurring radionuclides that may be present. Comparing the results of the soil screening with the screening values of the NCRP report, the 1996 characterization study showed potential spot contamination of soils north or northwest of the main buildings. However, the contamination is apparently wide spread in those areas predominately between the river, the main buildings and the eastern portion of the site. The major contaminants of concern are Cs 137 and Ra 226, only 4 grids were found with elevated americium 241 contamination. Those grids exceeding the NCRP screening values are given in Table II.

To determine the impact of direct radiation measurements collected during the 1995 characterization events, ATSDR used those grids where the exposures using a tissue equivalent radiation detector were greater than 50 microrem per hour over the entire grid or greater than 60 microrem per hour at 1 meter height within the grid. These results show that the highest levels of exposure are along the sides of the central building (main SLC structure in the center of site), the main process building to the east of the central building, and the liquid waste hold up tanks. Elevated exposure rates were not detected along the property boundaries.

Table II. Grids with surface soil concentrations above NCRP screening values*

Radionuclide	Grid	Measured Concentration Range	NCRP Screening Value†
Radium 226	13, 19, 20, 33, 45, 46, 113, 116, 126, 148, 203, 206, 229, 253, 254,	152 to 3335 pCi/g	5 pCi/g (40 CFR 192)
Americium 241	44, 185, 206, 228	23 to 72 pCi/g	12 pCi/g
Cesium 137	71, 101, 102, 108, 109, 110, 111, 114, 116, 128, 129, 130, 135, 150, 151, 157, 172, 173, 195, 201, 202, 206, 217, 218, 220, 221, 222, 223, 224, 229, 234, 238, 243, 246, 249, 251, 253, 254, 305, 306, 308	12 to 7265 pCi/g	12 pCi/g

* National Council on Radiation Protection and Measurements. Recommended screening limits for contaminated surface soil and review of factors relevant to site-specific studies. NCRP Report 129. January 1999.

† The selected screening value is the value recommended for a construction, commercial, or industrial scenario. This scenario assumes no dwellings or no children. Adult workers are considered exposed for short periods and the major route of exposures are from external, inhalation, ingestion.

CONCLUSIONS

Radioactive materials, specifically, tritium, strontium 90, cesium 137, radium 226, and americium 241, have been used and disposed of in silos, lagoons, and holding tanks associated with the Safety Light Corporation. From these disposal practices, radioactive material has contaminated the on-site areas of the SLC and perhaps nearby off-site residential wells (tritium only). The contaminants in the residential wells are not at levels of public health concern. The amount of land contaminated has been exacerbated by a flood of the Susquehanna River in 1972.

ATSDR has reviewed the environmental sampling data collected during three characterization events from 1980, 1994, and 1995 to 1996. These results show that surface soils are contaminated with cesium 137 and Ra 226 and that the contamination has apparently seeped from the soils to the groundwater. Soil contamination is mostly to the south and southeast of the main buildings as showed by the grid sampling system. Although the contamination has not yet reached the river, data strongly suggest the contamination is migrating in that direction. Additional contamination associated with the site is predominately between the main site buildings and the river but external exposure to ionizing radiation is localized along the outside of the buildings.

Because this site is fenced and is a limited access facility, ATSDR believes the current levels of radioactive contamination or external radiation do not pose a public health threat to members of the public or to the surrounding area outside the SLC fence line. The reasoning behind this finding is based on fact that the highest contamination levels are toward the inside of the facility away from the site boundaries and that no external radiation above an estimated site background of 10 microrem per hour exists at the property fence line. At those grids where the dose rate is greater than 60 microrem per hour, an inadvertent trespasser would have to spend, on average, an estimated 600 hours per year in the contaminated areas or 330 hours per year in the grid with the highest dose rate to reach the federal limit for external dose of 100 millirem per year to members of the public. However, those grids in which the surface soil contamination exceed the recommended screening levels of the NCRP warrant additional evaluation.

In the case of worker exposure, the employees of SLC are considered radiation workers thus their federal exposure limit is 5 times higher than the public dose limit, 500 millirem per year, and they are monitored for radiation exposure and radiation dose. Their exposures and doses, therefore, are the purview of the Nuclear Regulatory Commission or the appropriate Pennsylvania state agency. Nonetheless, if their dose reaches the federal limit or an administrative control limit set by SLC, the circumstances around this elevated dose should be investigated. ATSDR will not consider worker exposure under these circumstances.

In those instances where workers might be exposed to dusts from construction areas, potential concerns exist for inhalation of radiologically contaminated dusts. However, at this time, ATSDR is unaware of any remediation plans in these areas or existing air data to evaluate this potential scenario.

RECOMMENDATIONS

ATSDR makes the following recommendations to ensure protection of both the public and workers associated with the Safety Light Corporation.

1. Ensure the security of the site by routine monitoring of the fence, especially along the river where conditions might exist that would compromise the fence integrity.
2. Re-evaluate the grids listed in Table I. This would include specific analysis for radium 226 by alpha spectroscopy, specific analysis for strontium 90, and verification analysis for cesium 137.
3. If the reanalysis of the grids continues to show elevated concentrations of the radionuclides of concern, then we recommend fencing of these areas from the main site until remediation can be undertaken.
4. Continue monitoring the groundwater both onsite and offsite for tritium, cesium 137, radium 226, and strontium 90.

Paul A. Charp, Ph.D.
Senior Health Physicist

REFERENCES

1. Monserco Limited. Characterization survey of Safety Light Corporation site at Bloomsburg, Pennsylvania USA. Report Number Monserco/96/NB/1821. 1996
2. Data supplied by Mark Levin, Pennsylvania Department of Health. Data consists of photocopies from a hand written log book.
3. Memorandum dated July 27, 1994, from Donna Janda, Weston Technical Assistance Team, to Kevin Wood, Site Assessment Manager, Environmental Protection Agency, Region III.
4. National Council on Radiation Protection and Measurements. Recommended screening limits for contaminated surface soil and review of factors relevant to site-specific studies. NCRP Report 129. January 1999